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(71) Applicant : **FUKUVI CHEMICAL INDUSTRY
CO., LTD.
33-66, 38-sha-cho
Fukui-shi, Fukui-ken (JP)**

(72) Inventor : **Ueda, Yoshimi
2103, Nakano 1-chome
Fukui-shi, Fukui-ken (JP)
Inventor : Gyobu, Shinji
9-6, Innai 2-chome
Funabashi-shi, Chiba-ken (JP)**

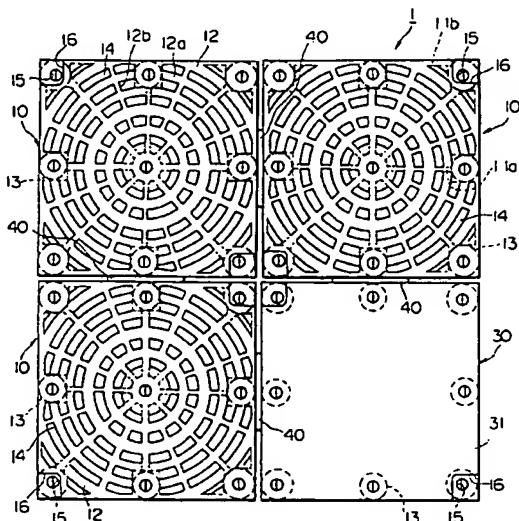
(74) Representative : **Mongrédiens, André et al
c/o SOCIETE DE PROTECTION DES
INVENTIONS 25, rue de Ponthieu
F-75008 Paris (FR)**

(54) **A panel unit for use in double floors.**

(57) A panel unit (1) for use in double floors is presented. The panel unit (1) has a plurality of panel bodies (10,30) comprising a plate (12) and leg parts. These panel bodies (10,30) are connected to each other by tie members (40). The panel unit (1) includes panel bodies (10,30) of at least two different types, one of which having a plate (12) of different surface feature from the other.

According to the invention, by placing the panel unit (1) all over the base floor, double floors having different surface features are constructed. In the upper floor of the panel unit (1), one type of panel body (30) has a smooth surface and the other (10) slits (14) through the body thereof. Therefore, an item such as a partition wall can be secured to the upper floor necessary location by screws on the smooth panel body (30) which is arranged regularly on the upper surface of the double floor. On the other hand, since the panel body (10) with slits (14) are also arranged regularly on the double floor, the condition of the wiring or piping beneath the upper floor can be inspected from above the floor from the opening of the slit (14) of the double floor area.

FIG.1



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Jouve, 18, rue Saint-Denis, 75001 PARIS

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(Field of The Invention)

This invention relates to a panel unit for use in double-floor construction for the purpose of installing subfloor services such as wiring beneath a floor.

(Background Art)

Recently, various types of electrical devices for office automation and the like have been introduced, especially in offices and so forth. The installation of the wiring for these electronic devices is generally carried out separately from the interior construction, and the simplest installation method involves the surface installation on the floor. However, the laying of a number of cables on the surface of the floor is not only unsightly but also hazardous, so that such installation is inconsistent with the attainment of an ideal office or living space, which has been recently increasingly in demand.

This installation can also be carried out by using two layers in the construction of the floor and installing these cables beneath the upper floor surface, as disclosed in Japanese Utility Model Laid Open Publication JUA-1991-66347. The upper layer of the double floors are constructed by arranging a plurality of panel bodies having a plurality of legs arranged at a fixed distance. The panel body is formed to have a plurality of arc-shaped slits penetrating therethrough. These slits decrease the weight of the panel body so that it can save materials and make handling operation easy, these slits further make it possible to view and check the condition of wiring or piping on the lower floor surface through the panel body. These panel bodies are formed in a rectangular shape, and several of them are connected to each other by tie members. These panel bodies and tie members are integrally formed from materials like plastic resins to make a panel unit as a whole.

The tie members are comprised of level portions protruding from the confronting side surfaces of the panel bodies and a U-shaped portion which connects the level portions.

However, in the conventional panel unit for use in double floors, it is not possible to plant screws into the panel body since the panel body comprises many slits. Moreover, the panel body has insufficient strength to stand the weight of items such as partition walls fixed thereto by screws or so.

It might be thought that the problem can be solved by preparing different types of panel unit comprising smooth panel bodies on which no slit is formed. By using this type of panel unit parallel with the panel units having slits, items such as partition walls can be fixed thereto. However, workers must treat these two panel units separately and arrange them separately, which is time consuming.

Referring to the tie member, several disadvan-

tages exist in the prior art. Since the tie member including the level portion is disposed in a space between the side surfaces of the panel bodies, rather a large distance is necessary between the two panel bodies. This means that certain spacing is present between the neighboring panel bodies. Therefore, the dimension of the tie member is made to be small, which renders the strength of the tie member low. Moreover, since the tie member includes several bending portions, they are likely to become initiating points for cracks. Further, since the shape of the tie member is complex, it is difficult to form it integrally with the panel unit, and the forming dies are also in a complex and leads to increasing manufacturing cost.

An object of the present invention is, therefore, to present a panel unit capable of affixing items like partition walls thereto by screws, while maintaining the advantages of panel body having slits, such as easy viewing of the space beneath the panel body and an easy handling of the panel bodies.

Another object of the invention is to present a panel unit, which can be closely connected by tie members having good strength, and which can be manufactured simply so as to save the manufacturing cost.

SUMMARY OF THE INVENTION

The present invention has been made to accomplish the object mentioned above, and is directed to a panel unit for use in double floors, having a plurality of panel bodies comprising a plate and leg parts, the leg parts being arranged in a rear surface of said plate at a distance to each other; and tie members made of flexible material, the panel bodies being connected to each other via said tie members, wherein said panel unit includes panel bodies of at least two different types, one of which having a plate of different surface feature from another.

According to the invention, by placing the panel units of a same type all over the base floor, double floors are constructed in which the upper floor comprises panel bodies of at least two different types. One of the panel body has a smooth surface and the other a surface with slits. Therefore, an item such as a partition wall can be secured to the upper floor at any location on the smooth panel body by screws which is arranged uniformly on the upper surface of the double floor. On the other hand, since the panel body with slits are also arranged uniformly on the double floor, the condition of wiring or piping beneath the upper floor can be checked from above the floor at any place of the double floor area. Further, since the construction is carried out by only placing one type of panel unit, its handling is easy and the construction work is not complicated so that the workability is maintained.

The present invention is also directed to a panel unit for use in double floors, having a plurality of panel

bodies comprising a plate and leg parts, said leg parts being arranged in a rear surface of said plate; and tie members made of flexible material, the panel bodies being connected to each other via the tie members, wherein the tie members comprise base portions protruding from rear surface of the plate in a periphery thereof and a circular portion connecting the distal ends of said base portion of neighboring panels.

According to the invention, since the tie member is arranged at the rear side of the plate, a space between panel bodies for arranging the tie member is not necessary. Therefore, the panel bodies can be arranged close to each other, and the tie member can be formed in larger size to have good strength. Further, the tie member includes bending portions only between the plate and the base portion, therefore it has less probability of initiating cracks which causes breakage. The probability of breakage owing to the bending portions is far less in the case that the base portion is formed as a part of a rib which is formed in the rear side of the plate, because the bending portion is supported by the rib.

Moreover, since the tie member is formed in a simple shape, the shape of the molds for forming it in molding process can be also simple.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of a panel unit of the first embodiment according to the present invention; Fig. 2 is a side view of the panel unit of Fig. 1; Fig. 3 is an enlarged cross-sectional view showing a vicinity of the leg part of Fig. 2; Fig. 4 is a plan view showing a connecting member; Fig. 5 is a side view of the connecting member of Fig. 4; Fig. 6 is a perspective view of double floors of the first embodiment of the invention; Fig. 7 is a partial cross-sectional side view of double floors of Fig. 6; Fig. 8 is a plan view of a panel unit of the second embodiment according to the present invention; Fig. 9 is a side view of the panel unit of Fig. 8; Fig. 10 is an enlarged cross-sectional view of the tie member of the panel unit of Fig. 8; Fig. 11 is a perspective view of double floors of the second embodiment of the invention; Fig. 12 is a partial cross-sectional side view of double floors of Fig. 11; Fig. 13 is a partial cross-sectional view of the panel body of the third embodiment according to the invention; Fig. 14 is a partial cross-sectional view of the auxiliary leg of Fig. 13; Fig. 15 is a plan view of the auxiliary leg of Fig. 13; Fig. 16 is a perspective view of the auxiliary leg of Fig. 13;

Fig. 17 is a partial cross-sectional view of auxiliary leg of another embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 A first embodiment of the present invention will be explained below by referring to Figs. 1 to 7.
 10 As shown in Figs. 1 and 2, a panel unit 1 is comprised of panel bodies 10, 30 and tie members 40.
 15 The panel body 10, 30 is comprised of:
 a plate 12 formed in a rectangular shape, in the rear surface of which a plurality of ribs 11a, 11b are formed;
 20 cylindrical parts 13 which are formed in the center and on the edge of the plate 12 so as to extend to the rear-surface side;
 pipe-shaped parts 21 which are inserted into the cylindrical parts 13 and fixed thereto;
 25 leg parts 20, which have a pole shape and steps 22 formed in the peripheral portion thereof, one end of which is fitted into attachment holes 21a formed within the pipe-shaped parts;
 elastic rings 23, which are placed around the circumference of each leg part 20 and are inserted between the step 22 and the lower end of the pipe-shaped part 21.
 30 Each panel unit 1 includes four panel bodies 10, 30, three of which are panel bodies of a "slit" type 10 and one is panel body of a "smooth" type 30. They are connected together by the tie members 40 to form a rectangular shape as a whole.
 35 On the plate 12 of the panel body of the slit type 10, a plurality of slits 14 are formed so that the plate 12 is comprised of arc-shaped portions 12a and straight portions 12b. Each of arc-shaped portions 12a and straight portions have inner ribs 11a in the rear side so as to have a T-shaped cross section
 40 On the panel body of smooth type 30, slits are not formed, and the inner ribs 11a on the rear surface are few in order to prevent interference with the screws which are for fixing the items like a partition wall. The plate 12 has enough thickness such as 2.5 mm for instance for receiving such screws thereon. The construction of the rest is the same as the panel body of slit type 10.
 45 Side ribs 11b are formed on both type of panel bodies 10, 30 which run along the periphery of the plate at a short distance from its edge.
 50 Access holes 15, for insertion of the screwdriver used in connecting groove 25 described hereinbelow, are formed through the plate 12 positioned above the axes of cylindrical parts 13, and in the four corners depressions 16 are formed, into which connecting members 52 described hereinbelow are fitted.
 55 The panel bodies 10, 30 are made of plastic material such as polypropylene resin or the like, and has standardized dimensions so as to allow volume pre-

fabrication at factories; such dimensions may be for example 250mm on a side and a height of 45mm.

Screw threads are formed on the outer circumference of the leg parts 20 and on the inner surface of the pipe-shaped parts 21, so that the leg parts 20 are screwed into the attachment holes 21a by engaging these threads. In addition, a connecting groove 25 for the purpose of fitting tools such as screwdriver or the like is formed in the surface of the end of leg parts 20 that screws into attachment holes 21a.

The tie members 40 are formed between the confronting surfaces of the side ribs 11b of neighboring panel bodies, which are integrally formed therewith. It is necessary to form the tie members 40 flexible enough to deform when the lower floor is uneven, and strong enough to prevent the interference of neighboring panel bodies 10, 30. Therefore, the tie members 40 have dimensions such as 2mm thickness, 10cm width and 2mm depth for instance.

In the above embodiment, a panel unit 1 is integrally formed to include a plurality of plates 12, cylindrical portions 13 and tie members 40, by a manufacturing process such as a molding process. However, it is possible to form these elements individually and fabricate them into a panel unit by adhesive bonding or welding.

By using this panel unit 1, double floors shown in Fig. 7 can be constructed without difficulty by the following procedure. First, a sheet 51 is laid on the surface of the lower floor 50 and is affixed thereto, so that it can absorb slight unevennesses existing on the surface. Then, panel units 1 are laid on the sheet 51 in order, and are connected by means of the attachment of the connecting member 52 to access holes 15. Each connecting member 52 has on its rear surface four projections 53, which are separated by fixed spaces and which fit into access holes 15; these four projections 53 fit into four access holes 15 of the four adjoining panel units 1. The connecting member 52 is also attached to the access holes 15 for relative positioning of four panel bodies 10, 30 which construct a panel unit 1.

In the case of large unevennesses existing in the ground beneath the floor which cannot be absorbed by the sheet, this can be compensated by rotating the leg parts 20 and for example lengthening a leg of a panel unit 1 which is in a depression. The rotation of this leg part 20 can be accomplished easily using connecting groove 25 by means of a tool such as a screwdriver the like inserted through the medium of an access hole 15 positioned in the upper surface of the floor. If there is any difference in the height between the neighboring panel units, the tie members deform in accordance with the difference. The construction of the double floors are accomplished by laying a flooring material 54 on the upper surface of the panel units 1 thus arranged and adhering it thereto.

In accordance with the double floor construction

by means of these panel units 1, it is possible to dispose cables and the like in the space 55 created beneath panel units 1, and thus provide wiring beneath the floor. When an item such as a partition member is desired to be placed on the floor surface, it can be fixed to a smooth panel body 30 by screws at any desired location of the upper surface of the double floor, because the smooth panel body 30 are uniformly arranged at panel units 1.

Further, since the panel bodies of slit type 10 are also arranged uniformly on the upper floor, the state of the wiring in the space 55 beneath the floor can be checked by sight in the same manner as in the prior art.

Therefore, by means of the panel unit 1, the partition member can be fixed thereto by screws at any desired location on the floor, while the advantages of the panel body having slits 14 are maintained, such that the panel unit 1 can be formed with less weight.

Further, since the panel unit 1 is standardized in one type, handling or arranging operability of the panel unit 1 is not spoiled.

DESCRIPTION OF OTHER EMBODIMENTS

The second embodiment of the invention will be described referring to Figs. 8 to 13 hereinafter.

In this embodiment, the construction of tie members 140 are different from the first embodiment. Therefore, tie members 140 will be explained by referring to Figs. 8 to 10.

Apertures of a rectangular shape in downward direction is formed on side ribs 11b of panel bodies 10, 30, and base portion 142 of a suitable depth d. A circular portion 141 is formed to bridge both surfaces of base portions 142 of the neighboring panel bodies 10, 30. The base portions and a circular portion constitute a tie member 140 which is formed integrally with the side rib 11b to have an almost U-shaped cross section as shown in Fig. 10. The circular portion 141 is formed to have a smaller thickness at the central portion than other portions thereof so that a uniform deformation will occur on both surfaces in a bending process.

In this embodiment, the depressions 16 are only formed at the outer corner of the panel unit 1, because the tie members 140 are strong enough to prevent the relative movement of the panel bodies 10, 30.

By using the panel unit 101 of this embodiment, double floors can be constructed by arranging the panel units 1 on the sheet 51 in order, and by connecting them with the connecting member 52 in the same manner as in the first embodiment as shown in Figs. 11 and 12.

By means of the panel units 1 explained above, the following effects can be obtained.

Since the tie member 140 is comprised of the base portions 142 and the circular portion 141, and the base portion 142 is protruding to the rear surface

of the plate 12 of the panel body 10, 30, the tie member 140 can be made without any dimensional restriction. Therefore, the tie member 140 can have a larger length than that of the first embodiment so that it can endure a larger force caused by a deviation of height between the neighboring panel units 1. Compared to the prior art of JUA-199166347 described above, the tie member 140 does not need a large space, it can be made to have a higher strength as well as higher flexibility. Especially, the base portion 142 is reinforced so as to be prevented from breakage since the tie member 140 is formed to have the base portion 142 in common with the side rib 11b, as well as the base portion 142, which is bent from the plate 12 and on which much force is likely to act, are reinforced. Therefore, the tie member 140 makes the panel unit 1 highly applicable to on-site in the constructing activities.

Further, by means of the panel unit 1 of the present embodiment, since the tie member 140 is formed in a simple shape, it can be easily integrated into the panel unit 1 by fabricating or other manufacturing processes. If the molding process is used, molds can be constructed in a simple shape, thus leading to a lower manufacturing cost.

In the above, the tie member 140 is formed integrally with the panel body 10, 30 in advance. However, it is possible to construct a panel unit 1 by forming each of the panel body 10, 30 separately and joining on the tie member 140 afterwards by fusing or welding for instance. In this case, the tie member 140 is formed integrally with the panel body 10, 30 to have the base portion 142 and a half of circular portion 141, and is joined to each other by fusing the distal end of the half circular portion. The leg part 120 is formed separately from the cylindrical portion 113, however, it is possible to form them all integrally with the panel body 10, 30 as shown in Fig. 13.

An auxiliary leg 60, 70 will be described below which is used with the panel unit 1, by referring to Figs. 13 to 17.

The auxiliary leg 60 is formed as a hollow bar member 61 having almost the same diameter as the cylindrical parts 113. The auxiliary leg 60 is formed to have a smaller diameter section 63, for the purpose of reinforcing it as well as preventing interference with the ribs 11a, 11b. A plurality of fitting grooves 62 is formed at the end surface of the smaller diameter section 63, which are fitted to the ribs 11a, 11b of the panel body 10, 30. In the embodiment, two fitting grooves 62 are formed so that the inner ribs 11b of the circular portion 12a can be fitted thereto. However, it is possible to form the fitting grooves 62 in a different way so as to correspond to the different patterns of the ribs of the panel body 10, 30.

The auxiliary leg 60 is used when there is some excess space S which cannot be filled by the panel unit 1 as shown in Fig. 12. In order to fill the space S

with panel unit 1 by using the auxiliary leg 60, the following steps are taken. First, a panel body is cut in accordance with the shape and size of the space S, along a cutting line x shown in Fig. 13 for instance. If the space S is wide and the panel body includes the central legs as the left portion of the cutting line x in Fig. 13, it is unnecessary to use the auxiliary leg 60. When the space S is narrow and the panel body 10, 30 does not include the central legs, auxiliary legs 60 are attached to the panel body 10, 30 at the necessary location. The attaching operation can be done only by fitting the fitting grooves 62 of the auxiliary leg 60 to the inner ribs 11a of the panel body 10, 30 in a way to push it in the y-direction in Fig. 13. Several types of auxiliary legs 60 having different length can be prepared for convenience of installation if necessary. Preparing different types of auxiliary legs 60 is simpler compared to preparing different types of panel units 1.

By means of the auxiliary leg 60, one or a plurality of auxiliary legs can be arranged at any desired location by utilizing the ribs 11b already formed on the panel body 10, 30. Therefore, it is unnecessary to treat or process the panel body 10, 30 at the construction site. Thus, the auxiliary leg 60 can save the on-site work to expand the applicability of the panel unit 1. Further, the auxiliary leg 60 makes it possible to construct stable and reinforced double floors, because the auxiliary leg 60 can be arranged in the most suitable location. Moreover, the auxiliary leg 60 can save the construction cost because it makes preparing different types of panel unit 1 unnecessary.

The other embodiment of the auxiliary leg 70 is shown in Fig. 9 in which the length of the auxiliary leg 70 is adjustable. The auxiliary leg 70 is comprised of an attaching portion 71 and a leg member 72. The attaching portion 71 is cylindrically formed, on the inner surface in which a female thread 73 is formed. The leg member 72 is basically the same as the leg part 20 of the panel body 10 in Fig. 3, on the outer periphery on which a male thread 74 is formed so as to be engageable with the female thread 73.

In the embodiment, the adjustment can be easily done only by rotating the leg member 72.

45

Claims

1. A panel unit for use in double floors, having
50 a plurality of panel bodies comprising a plate and leg parts, said leg parts being arranged in a rear side of said plate;
tie members made of a flexible material,
said panel bodies being connected to each other via said tie members in a manner that said plates are arranged in a virtual plane, wherein
55 said panel unit includes panel bodies of at least two different types, each of which having a

plate of different surface characteristics to each other.

2. A panel unit for use in double floors according to claim 1, wherein one type of said panel body comprises a plate in which a plurality of slits are formed therethrough, while the other type of panel body comprises a solid plate to which an item can be attached.

3. A panel unit for use in double floors according to claim 1, wherein said plate is formed in a rectangular shape.

4. A panel unit for use in double floors according to claim 1, wherein said plate is formed in a square shape.

5. A panel unit for use in double floors according to claim 1, wherein said panel unit comprise four panel bodies.

6. A panel unit for use in double floors according to claim 1, wherein said panel bodies and said tie members are formed integrally.

7. A panel unit for use in double floors according to claim 1, wherein the length of said leg parts is adjustable.

8. A panel unit for use in double floors according to claim 1, further comprising a connecting means for connecting a plurality of panel units together.

9. A panel unit for use in double floors according to claim 1, wherein said tie members comprise base portions protruding from the rear peripheral surface of said plate and a circular portion connecting the distal ends of said base portions of neighboring panel units.

10. A Panel unit for use in double floors, having a plurality of panel bodies comprising a plate and leg parts, said leg parts being arranged in a rear surface of said plate; tie members made of flexible material, said panel bodies being connected to each other via said tie members in a manner that said plates are arranged in a virtual plane, wherein said tie members comprise base portions protruding from rear surface of said plate in the periphery thereof and a circular portion connecting the distal ends of said base portion of neighboring panel units.

11. A panel unit for use in double floors according to

claim 10, wherein said base portion is formed as a part of a rib formed at the rear surface of said plate.

5 12. A panel unit for use in double floors according to claim 10, wherein said plate is formed in a rectangular shape.

10 13. A panel unit for use in double floors according to claim 10, wherein said plate is formed in a square shape.

15 14. A panel unit for use in double floors according to claim 10, comprising four panel bodies.

15 15. A panel unit for use in double floors according to claim 10, wherein said panel bodies and said tie members are formed integrally.

20 16. A panel unit for use in double floors according to claim 10, wherein the length of said leg parts is adjustable.

25 17. A panel unit for use in double floors according to claim 10, further comprising a connecting means for connecting a plurality of panel units together.

30 18. A panel unit for use in double floors according to claim 10, further comprising an auxiliary leg attachable to said plate, said auxiliary leg comprising a fitting groove at the end surface thereof for fitting to said rib of said plate.

35 19. A panel unit for use in double floors according to claim 18, wherein said auxiliary leg is formed in a cylindrical shape.

40 20. A panel unit for use in double floors according to claim 18, wherein the length of said auxiliary leg is adjustable.

FIG.1

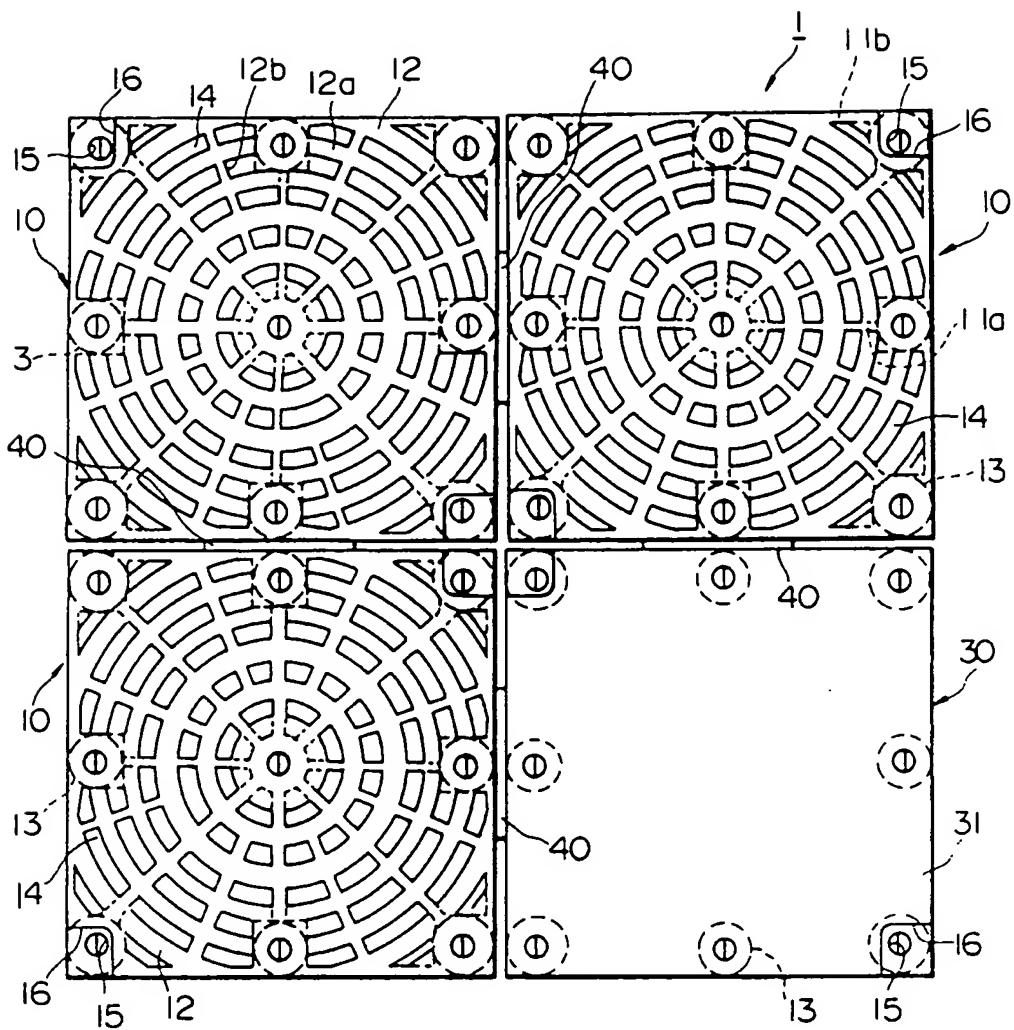


FIG.2

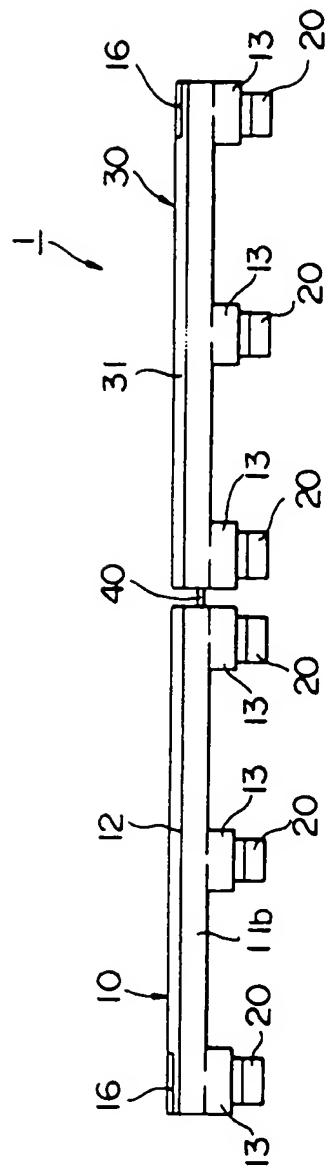


FIG.3

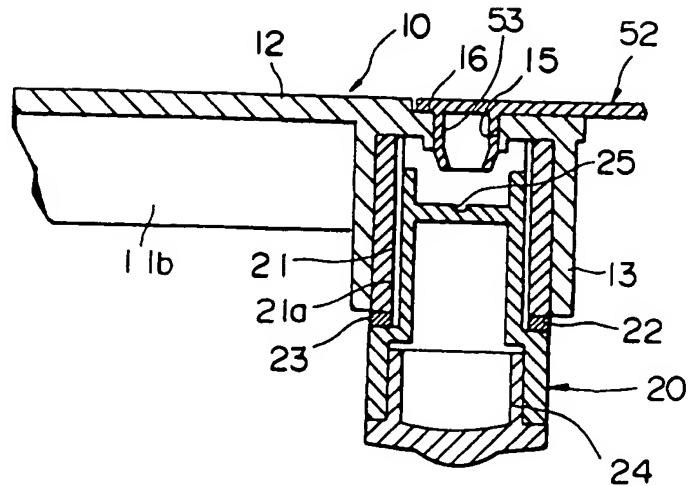


FIG.4

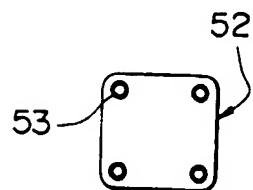


FIG.5

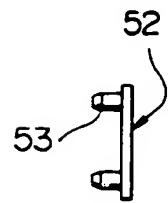


FIG.6

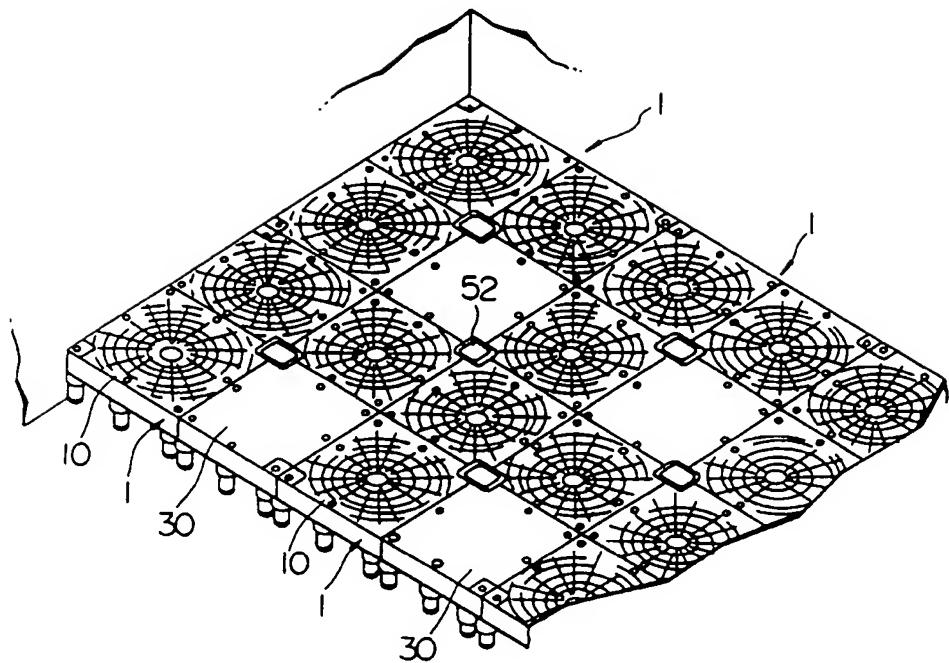


FIG.7

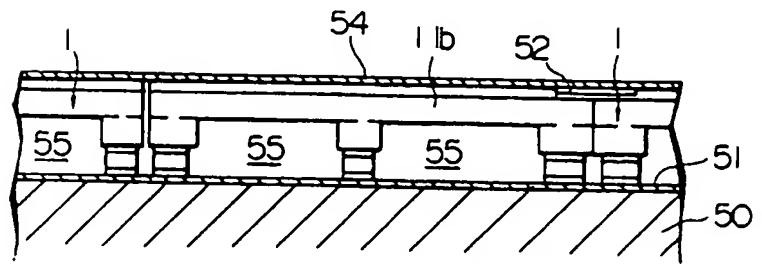


FIG.8

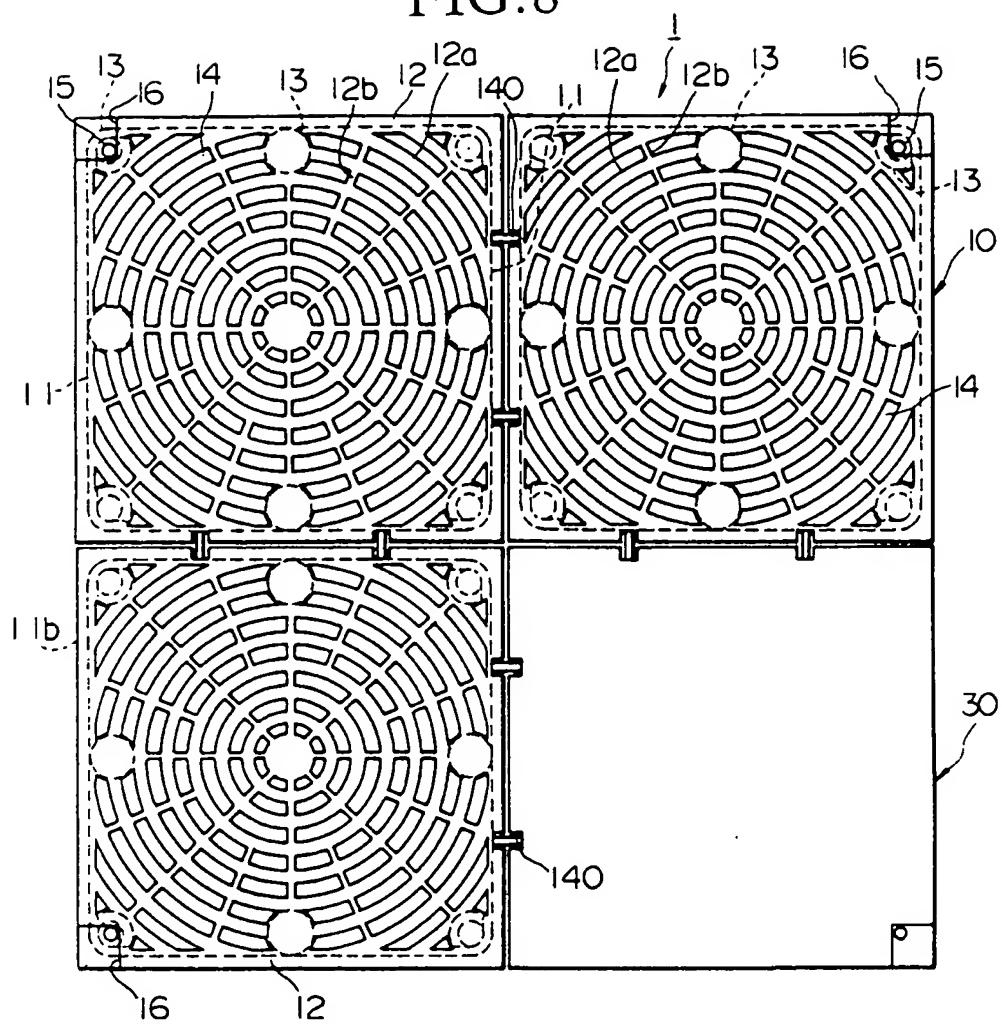


FIG.9

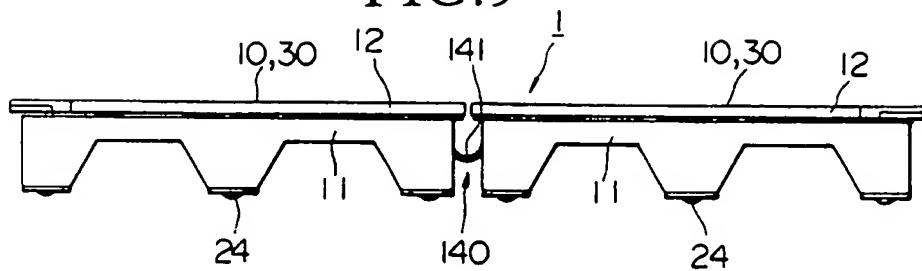


FIG.10

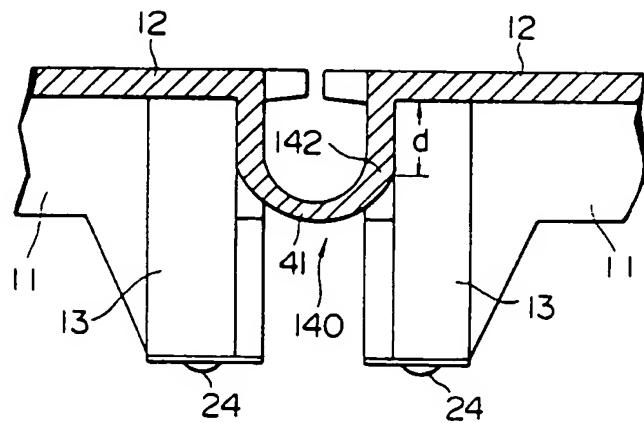


FIG.11

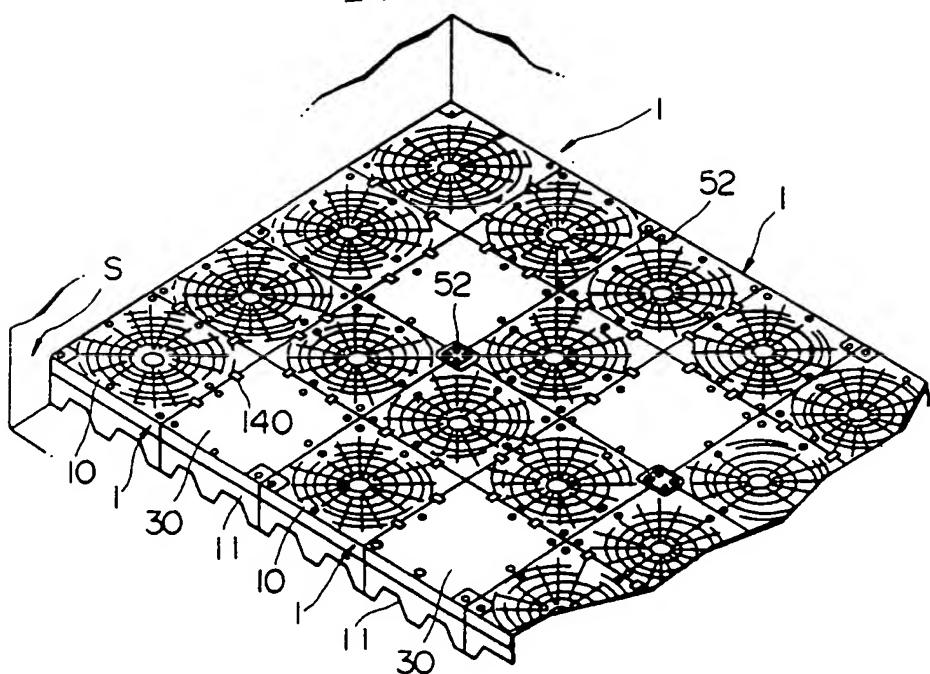


FIG.12

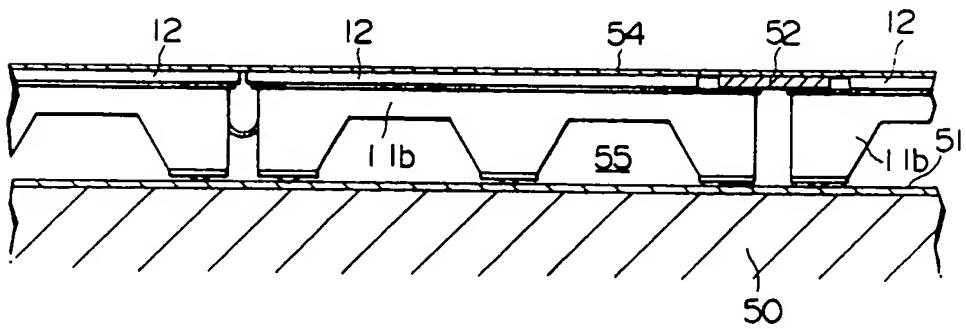


FIG.13

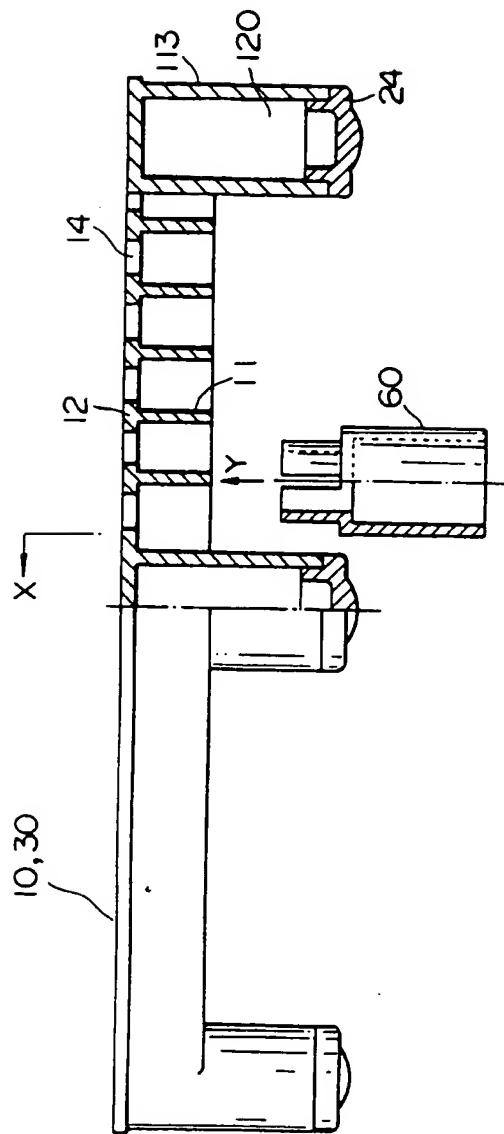


FIG.14

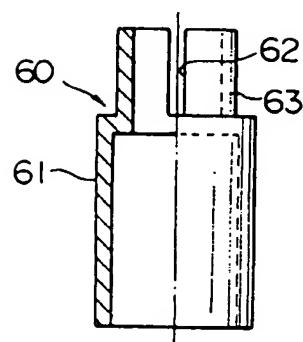


FIG.15

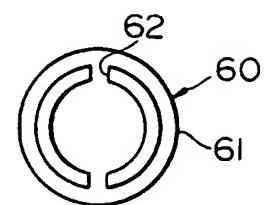


FIG.16

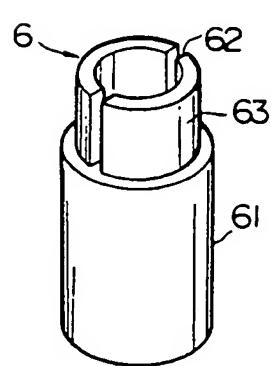
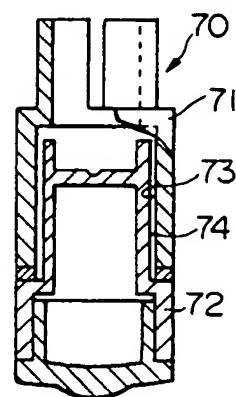


FIG.17





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 40 0561

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL.5)						
A	FR-A-2 236 072 (CHENEL) * page 1, line 1 - line 13 * * page 3, line 6 - page 5, line 39; figures 1-4 * --- A WD-A-8 602 969 (MATTHEWS) * page 6, line 1 - page 16, line 5; figures 1-14 * --- A EP-A-0 411 568 (HITACHI METALS, LTD.) * column 2, line 39 - column 4, line 38; figures 1-10 * * --- A FR-A-1 511 222 (DENIS ET AL) * page 1, left column, line 1 - page 2, left column, line 12; figures 1-4 * * ---	1-3, 12 1, 3, 6, 9, 10, 15 1-4, 8, 10, 12, 13 1, 3, 4, 7, 10, 12, 13, 18, 20	E04F15/024						
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)						
			E04F						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>30 JUNE 1992</td> <td>AYITER J.</td> </tr> </table> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>				Place of search	Date of completion of the search	Examiner	THE HAGUE	30 JUNE 1992	AYITER J.
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